1. If the revenue is given by $R = 560x - 0.07x^2$, find the value of x that yields the maximum revenue.

   [A] 24,000   [B] 8000   [C] 4000   [D] 4500

2. A small manufacturing firm collected the following data on advertising expenditures (in thousands of dollars) and total revenue (in thousands of dollars).

Advertising	Total Revenue
20	7311
21	7308
26	7315
27	7313
29	7313
32	7311
35	7310
36	7307

   Find the quadratic function of best fit.

   [A] $y = -0.049x^2 + 5.441x + 7103$ [B] $y = -0.078x^2 + 4.235x + 7256$

   [C] $y = -0.015x^2 + 4.028x + 7163$ [D] $y = -1.062x^2 + 3.954x + 7981$
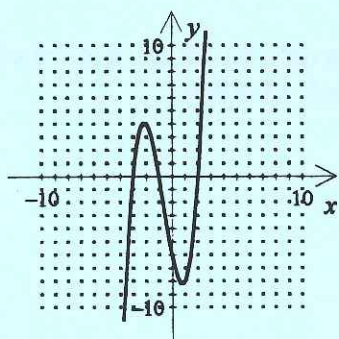
Precalculus 40-41
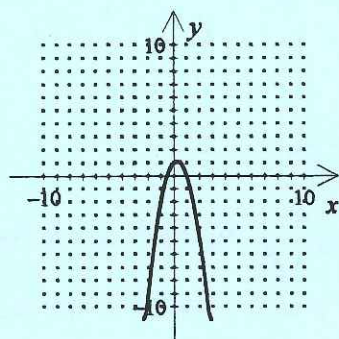**Exam Review Part II**
Starred problems are for Precalculus 41 only!

3. Write a polynomial function that has the zeros –3, 2, and –1 and has a leading coefficient of 1. Then, graph the function to show that –3, 2, and –1 are solutions / x-intercepts of the polynomial.
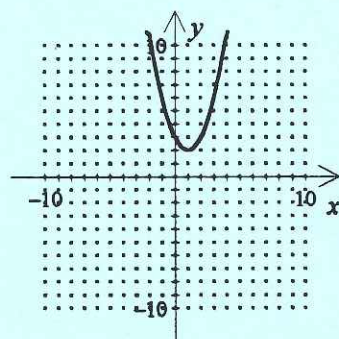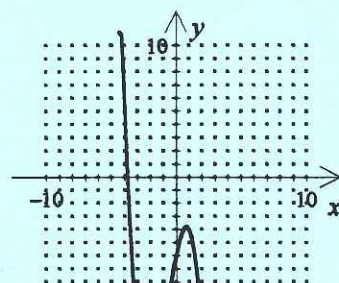
[A]

$y = x^3 + 2x^2 - 5x - 6$

[B]

$y = x^2 + x - 2$

[C]

$y = 3x^2 - 2x + 1$

[D]

$y = -x^3 - 2x^2 + 5x - 6$

4. The table shows the number of hybrid cottonwood trees planted in tree farms in Oregon since 1987. Find a cubic function to model the data and use it to estimate the number of cottonwoods planted in 1998.

Years since 1987	1	3	5	7	9
Trees planted (in thousands)	1.1	13.7	51.9	130.1	262.7

[A] $0.5x^3 + 0.2x^2 + 0.4x + 0.2$; 453.9 thousand

[B] $0.3x^3 + 0.2x^2 + 0.2x + 0.2$; 464.1 thousand

[C] $0.5x^3 + 0.5x^2 + 0.2x - 0.1$; 453.9 thousand

[D] $0.3x^3 + 0.5x^2 + 0.4x - 0.1$; 464.1 thousand

5. Use Descartes' Rule of Signs to determine how many positive and how many negative real zeros the polynomial functions may have. Do not attempt to find the zeros.
$f(x) = x^6 + 3x^5 + 5x^4 - 2x^3 + 3x^2 + 4x + 5$

[A] 4, 2, or no positive real zeros; 2 or no negative real zeros

[B] 2 or no positive real zeros; 4, 2, or no negative real zeros

[C] 3 or 1 positive real zeros; 4, 2, or no negative real zeros

[D] 2 or no positive real zeros; 5, 3, or 1 negative real zeros

6. List all of the potential rational zeros of the polynomial function. Do not attempt to find the zeros. $f(x) = 5x^3 - 7x^2 - 6x + 10$

[A] $\pm 2, \pm 5, \pm 10, \pm\frac{1}{5}, \pm\frac{2}{5}, \pm\frac{7}{5}$

[B] $\pm 2, \pm 5, \pm 10, \pm 50, \pm\frac{1}{5}, \pm\frac{2}{5}$

[C] $\pm 1, \pm 2, \pm 5, \pm 10, \pm\frac{1}{5}, \pm\frac{2}{5}$

[D] $0, \pm 1, \pm 2, \pm 5, \pm\frac{1}{5}, \pm\frac{2}{5}$

7. Find the rational zeros of f. List any irrational zeros correct to two decimal places.

$f(x) = x^3 + 6x^2 + 8x - 3$

[A] rational zero: 3, irrational zeros $\approx$ 3.30, –0.30

[B] rational zero: –3, irrational zeros $\approx$ 0.60, –6.60

[C] rational zero: 3, irrational zeros $\approx$ 6.60, –0.60

[D] rational zero: –3; irrational zeros $\approx$ 0.30, –3.30

8. Divide and simplify to the form $a + bi$: $\dfrac{5+i}{5+9i}$

[A] none of these   [B] $\dfrac{17}{53} - \dfrac{20}{53}i$ [C] $1 - \dfrac{1}{9}i$ [D] $\dfrac{8}{53} + \dfrac{25}{53}i$

9. Solve: $x^2 + 2x + 10 = 0$

[A] $-1 + 6i, -1 - 6i$ [B] $-1 + 3i, -1 - 3i$

[C] $1 + 3i, 1 - 3i$ [D] $1 + 6i, 1 - 6i$

10. Find all of the complex zeros of the polynomial function

$f(x) = x^4 - 6x^3 + 6x^2 + 24x - 40$.

[A] $3, -3, 2 - 2i, 2 + 2i$ [B] $3, -3, 2 - i, 2 + i$

[C] $2, -2, 3 - i, 3 + i$ [D] $2, -2, 3 - 2i, 3 + 2i$

11. Solve the inequality and write the solution set in interval notation.

$x^3 + 5x^2 - x - 5 < 0$

[A] $(-2, -\dfrac{1}{2}) \cup (\dfrac{1}{2}, \infty)$ [B] $(-\infty, -\dfrac{5}{2}) \cup (-2, \dfrac{5}{2})$

[C] $(-\dfrac{3}{2}, 1) \cup (\dfrac{3}{2}, \infty)$ [D] $(-\infty, -5) \cup (-1, 1)$
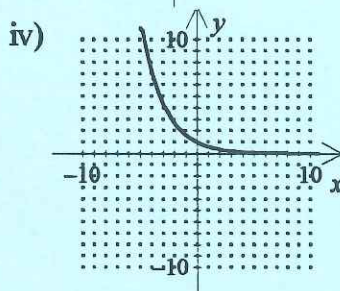
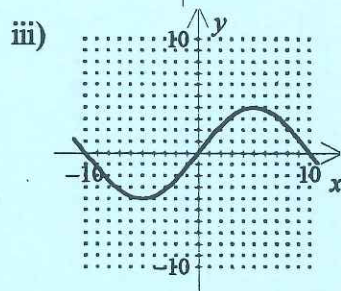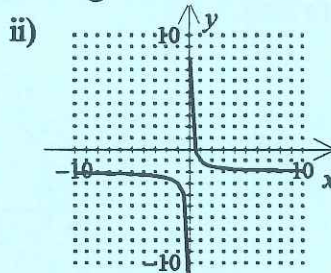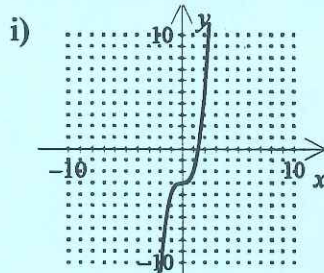12. Solve the inequality: $\dfrac{(x-9)(x+6)}{x-4} \geq 0$

[A] $-6 \leq x \leq 4$ [B] $x \geq 9$ or $-6 \leq x < 4$ [C] $x \geq 9$ [D] $x \leq -6$

13. Determine which of the following is a one-to-one function.

i)

ii)

iii)

iv)

14. Determine the equation for the inverse function of $y = (x + 8)^3 + 2$.

[A] $y = \sqrt[3]{x-8} - 2$ [B] $y = \sqrt[3]{x} - 10$ [C] $y = \sqrt[3]{x-2} - 8$ [D] $y = \sqrt[3]{x+6}$

15. The formula $P = 14.7e^{-0.21x}$ gives the average atmospheric pressure, P, in pounds per square inch, at an altitude x, in miles above sea level. Find the average atmospheric pressure for an altitude of 8.5 miles. Round your answer to the nearest tenth.

[A] 1.8 lb/in^2 [B] 4.4 lb/in^2 [C] 1.2 lb/in^2 [D] 2.5 lb/in^2

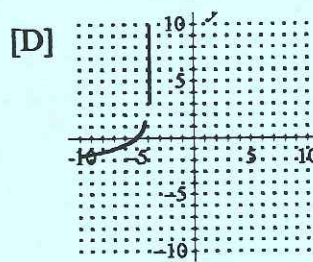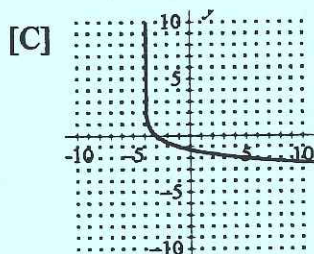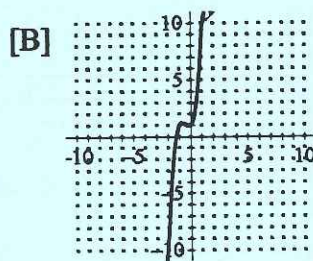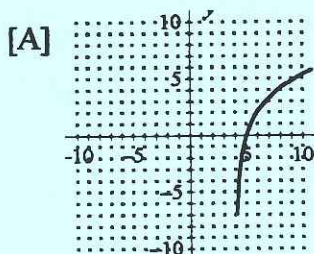16. Determine the domain of the function $f(x) = \log_{\frac{1}{2}}(x-3)$.

[A] $(-3, \infty)$ [B] $(-\infty, 3)$ [C] $(3, \infty)$ [D] $(-\infty, -3)$

17. Graph the function $f(x) = \log_{\frac{1}{3}}(x+4)$.

[A]

[B]

[C]

[D]

18. Evaluate $\log_6 28$. Round your answer to the nearest hundredth.

[A] 0.54 [B] 1.86 [C] 3.33 [D] 1.79

19. What principal invested at 11% compounded continuously for 2 years will yield $1300?
Round the answer to two decimal places.

[A] $1043.27 [B] $1298.75 [C] $837.25 [D] $1619.90

20. How long does it take $1400 to triple if it is invested at 8% interest compounded
quarterly? Round your answer to the nearest tenth.

[A] 16.2 years [B] 13.9 years [C] 16.2 months [D] 13.9 months

21. A certain radioactive material decays according to the law $A = A_0 e^{-0.0337t}$, where A_0 is
the initial amount present and A is the amount present in t years. What is the half-life of
this material? Round the answer to two decimal places.

[A] 20.57 [B] 59.35 [C] 41.14 [D] impossible to determine without knowing A_0

Precalculus 40-41
Exam Review Part II
Starred problems are for Precalculus 41 only!

22. A cup of coffee is heated to 190° and is then allowed to cool in a room whose air temperature is 60°. After 12 minutes, the temperature of the cup of coffee is 149°. Find the time needed for the coffee to cool to a temperature of 108°.

 [A] 52.3 minutes   [B] 14.7 minutes   [C] 31.6 minutes   [D] 34.9 minutes

23. Early in the 1900s, an airplane manufacturer was able to increase the time its planes could stay aloft by constantly refining its techniques. Find an exponential equation that models the data.

Years after 1910	1	2	3	4	5	6
Time aloft (hrs)	0.77	1.2	2.2	3.8	4.4	5.7

 [A] $y = 0.567(x)^{1.511}$ [B] $y = 1.511(0.567)^x$

 [C] $y = 0.77(5.7)^x$ [D] $y = 0.567(1.511)^x$

24. What is the magnitude of an earthquake whose seismographic reading is 11.1 millimeters at a distance of 100 kilometers from its epicenter?

 [A] 2.4069   [B] 0.40453   [C] 0.24069   [D] 4.0453

25. Find the exact value of $\cos\dfrac{\pi}{3} - \tan\dfrac{\pi}{3}$. Do not use a calculator.

 [A] $\dfrac{\sqrt{3}}{2}$ [B] 0   [C] $\dfrac{1 - 2\sqrt{3}}{2}$ [D] 0

26. Find the domain and range of $f(t) = \cos t$.

 [A] D: $-1 \le t \le 1$ [B] D: $-\infty < t < \infty$
      R: $-\infty < f(t) < \infty$ R: $-1 \le f(t) \le 1$

 [C] D: $-\infty < t < \infty$ [D] D: $-\infty < t < \infty$
      R: $-\infty < f(t) < \infty$ R: $-\dfrac{\pi}{2} < f(t) < \dfrac{\pi}{2}$

27. Given $\sin \theta = \dfrac{1}{2}$ and $\sec \theta < 0$, find $\cos \theta$ and $\tan \theta$.

[A] $\cos \theta = -\dfrac{\sqrt{3}}{2}$, $\tan \theta = -\dfrac{1}{\sqrt{3}}$ [B] $\cos \theta = -\sqrt{3}$, $\tan \theta = -\dfrac{12}{\sqrt{3}}$
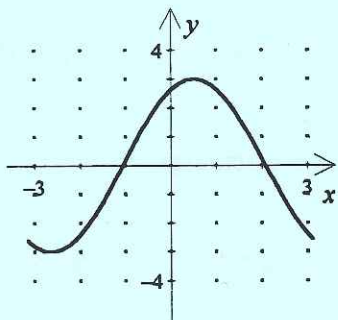
[C] $\cos \theta = \dfrac{\sqrt{3}}{2}$, $\tan \theta = \dfrac{1}{\sqrt{3}}$ [D] $\cos \theta = -\dfrac{\sqrt{3}}{2}$, $\tan \theta = \dfrac{1}{\sqrt{3}}$
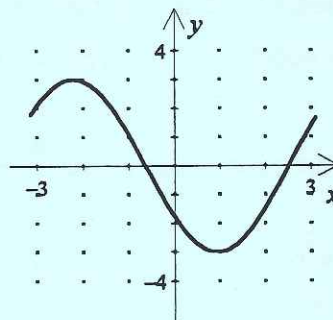
28. Evaluate: $\sin \dfrac{4}{3}\pi$ [A] $\dfrac{\sqrt{3}}{2}$ [B] $\dfrac{1}{2}$ [C] $-\dfrac{1}{2}$ [D] $-\dfrac{\sqrt{3}}{2}$

29. Graph $y = -3 \cos \left(x + \dfrac{\pi}{5}\right)$ on the interval $-\pi \leq x \leq \pi$.
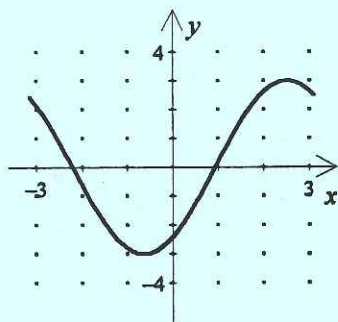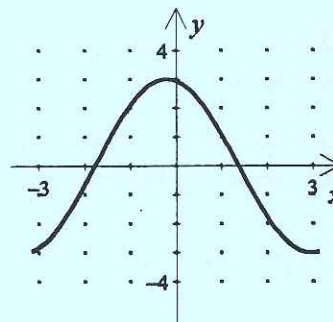
[A]

[B]

[C]

[D]

Precalculus 40-41
Exam Review Part II
Starred problems are for Precalculus 41 only!

30. Find two values of θ for the trigonometric equation $\sin\theta = 0.866$. Round your answer to the nearest degree.

[A] 240°, 300°   [B] 60°, 120°   [C] 120°, 300°   [D] 60°, 240°

31. A photographer points a camera at a window in a nearby building forming an angle of 43° with the camera platform. If the camera is 56 m from the building, how high above the platform is the window, to the nearest hundredth?
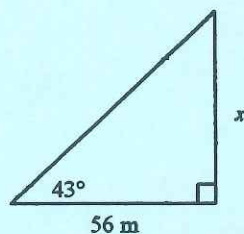
[A] 1.07 m   [B] 0.93 m   [C] 60.05 m   [D] 52.22 m

32. The function below describes a simple harmonic motion where d is the distance an object travels in time t.

$$d = -7\cos\frac{\pi}{2}t$$

What is the frequency?

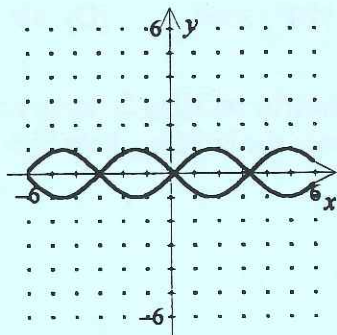[A] $\dfrac{\pi}{2}$ [B] $\dfrac{1}{4}$ [C] –7   [D] 4

33. Graph the polar equation $r = 5 \sin 3\theta$, $0 \leq \theta \leq 2\pi$.
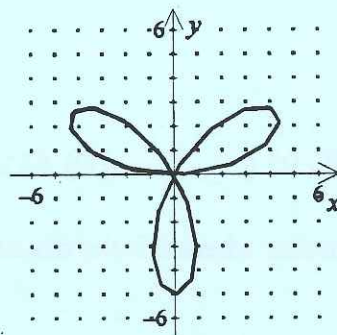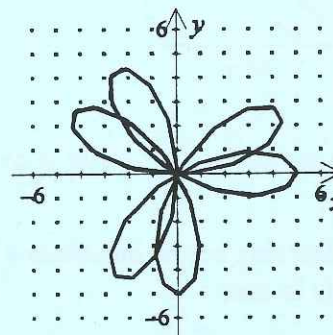
[A]

[B]
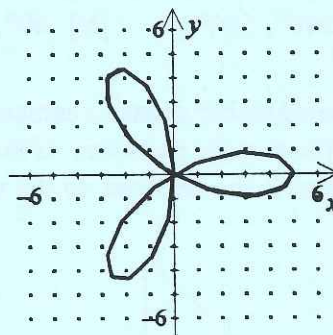
[C]

[D]

✳ 34. Determine the polar form of the complex number $3 + 2i$. Express the angle θ in degrees, where $0 \leq \theta < 360°$, and round numerical entries in the answer to two decimal places.

[A] $3.61(\sin 33.69° + i \cos 33.69°)$ 　　　[B] $3(\cos 33.69° + i \sin 33.69°)$

[C] $3.61(\cos 33.69° + i \sin 33.69°)$ 　　　[D] $13(\cos 56.31° + i \sin 56.31°)$

35. Find the position vector of the vector $\vec{v} = \overrightarrow{JK}$ if $J = (-3, -4)$ and $K = (-5, -6)$.

[A] $-2\vec{i} - 2\vec{j}$ 　　　[B] $-2\vec{i} + 2\vec{j}$ 　　　[C] $-8\vec{i} - 10\vec{j}$ 　　　[D] $2\vec{i} + 2\vec{j}$

36. Given $E(-3, -5)$ and $F(-5, -3)$, find the magnitude of $\overrightarrow{EF}$ to the nearest tenth.

[A] 8 　　　[B] 2.8 　　　[C] 11.3 　　　[D] 0

✳37. Let $\vec{r} = -6\vec{i} - 8\vec{j}$ and $\vec{s} = -7\vec{i} + 4\vec{j}$. Find the dot product of the two vectors.

[A] 74　　　　　　　[B] 76　　　　　　　[C] 20　　　　　　　[D] 10

✳38. Which of the following vectors is orthogonal to $-8\vec{i} + 10\vec{j}$?

[A] $16\vec{i} - 20\vec{j}$　　[B] $-15\vec{i} - 12\vec{j}$　　[C] $5\vec{i} + 5\vec{j}$　　[D] $2\vec{i} + 7\vec{j}$

✳39. Find the work done to the nearest foot-pound by a force of 120 pounds acting in the direction $\vec{i} - 4\vec{j}$ in moving an object 75 feet from $(0, 0)$ to $(0, -75)$.

[A] 8731 foot-pounds　　　　　　　[B] 12,000 foot-pounds

[C] 2183 foot-pounds　　　　　　　[D] 9000 foot-pounds

40. Write the parametric representation for $\dfrac{x^2}{36} - \dfrac{y^2}{100} = 1$

[A] $x = 6 \cos t,\ \ y = 10 \sin t$　　　　　[B] $x = 6 \cosh t,\ \ y = 10 \sinh t$

[C] $x = 10 \cos t,\ \ y = 6 \sin t$　　　　　[D] $x = 10 \cosh t,\ \ y = 6 \sinh t$

✳41. Multiply: $(w - r)^4$

[A] $w^4 - 6w^3 r + 8w^2 r^2 - 6wr^3 + r^4$　　　　　[B] $w^4 - 4w^3 r + 6w^2 r^2 - 4wr^3 + r^4$

[C] $w^4 - r^4$　　　　　[D] $w^4 - 4w^3 r - 12w^2 r^2 + 24wr^3 + 24r^4$

✳✳42. Write the partial fraction decomposition of $\dfrac{-8x^3 - 2}{x^2(x-1)^3}$.

[A] $-\dfrac{6}{x} + \dfrac{2}{x^2} + \dfrac{6}{x-1} - \dfrac{4}{(x-1)^2} + \dfrac{10}{(x-1)^3}$

[B] $\dfrac{6}{x} - \dfrac{2}{x^2} - \dfrac{6}{x-1} + \dfrac{4}{(x-1)^2} - \dfrac{10}{(x-1)^3}$

[C] $-\dfrac{6}{x} - \dfrac{2}{x^2} + \dfrac{6}{x-1} + \dfrac{4}{(x-1)^2} + \dfrac{10}{(x-1)^3}$

[D] $\dfrac{6}{x} + \dfrac{2}{x^2} - \dfrac{6}{x-1} - \dfrac{4}{(x-1)^2} - \dfrac{10}{(x-1)^3}$

Part I

1) C	21) B
2) A	22) A
3) A	23) B
4) B (D)	24) D
5) C	25) A
6) C	26) C
7) B	27) B
8) D	28) D
9) E	29) E
10) A	30) A
11) B	31) A
12) E B	32) B
13) D	33) D
14) A	34) B
15) D	35) E B
16) E	36) C
17) C	37) C
18) D	38)
19) C	39) A
20) D	40) D
	41) A
	42) A

[1] C		[25] C	
[2] B		[26] B	
[3] A		[27] A	
[4] D		[28] D	
[5] B		[29] C	
[6] C		[30] B	
[7] D		[31] D	
[8] B		[32] B	
[9] B		[33] C	
[10] C		[34] C	
[11] D		[35] A	
[12] B		[36] B	
[13] i, ii and iv only		[37] D	
[14] C		[38] B	
[15] D		[39] A	
[16] C		[40] B	
[17] C		[41] B	
[18] B		[42] D	
[19] A			
[20] B			
[21] A			
[22] C			
[23] D			
[24] D			